

# Quick Summary of Fossil Butte NM GRI meeting May 23, 2002

## Summary

A geologic resources inventory workshop was held for Fossil Butte NM (FOBU) on May 23, 2002 to view and discuss the park's geologic resources, to address the status of geologic mapping for compiling both paper and digital maps, and to assess resource management issues and needs. Cooperators from the NPS Geologic Resources Division (GRD), NPS Intermountain Region GIS group, NPS Fossil Butte NM, Colorado State University, and Loma Linda University were present for the workshop.

This involved a field trip to view the geology of the Fossil Butte NM area and a scoping session to present overviews of the NPS Inventory and Monitoring (I&M) program, the Geologic Resources Division, and the on-going Geologic Resources Inventory (GRI). Round table discussions involving geologic issues for Fossil Butte NM included interpretation, the status of geologic mapping efforts, sources of available data, and action items generated from this meeting.

Fossil Butte NM has in its enabling legislation a charge to develop the geologic story of the Green River Basin for the general public. New, large-scale geologic mapping of the basin will contribute to this cause significantly, and hence the mapping of (12) 7.5' quadrangles is now underway for this purpose.

**For a list of Attendees and their contact information, see Appendix A.**

## OVERVIEW OF GEOLOGIC RESOURCES INVENTORY (GRI)

The NPS GRI has the following goals:

1. to assemble a bibliography of associated geological resources for NPS units with significant natural resources ("GRBIB") to compile and evaluate a list of existing geologic maps for each unit,
2. to conduct a scoping session for each park,
3. to develop digital geologic map products, and
4. to complete a geological report that synthesizes much of the existing geologic knowledge about each park.

It is stressed that the emphasis of the inventory is **not** to routinely initiate new geologic mapping projects, but to aggregate existing "baseline" information and identify where serious geologic data needs and issues exist in the National Park System. In cases where map coverage is nearly complete (ex. 4 of 5 quadrangles for Park "X") or maps simply do not exist, then funding may be available for geologic mapping.

After introductions by the participants, Tim Connors (NPS-GRD) presented overviews of the Geologic Resources Division, the NPS I&M Program, the status of the natural

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resource inventories, and the GRI in particular.

He also presented a demonstration of some of the main features of the GRI digital geologic database. This has become the prototype for the NPS digital geologic map model as it reproduces all aspects of a paper map (i.e. it incorporates the map notes, cross sections, legend etc.) with the added benefit of being geospatially referenced. It is displayed in ESRI ArcView shape files and features a built-in Microsoft Windows help file system to identify the map units. It can also display scanned JPG or GIF images of the geologic cross sections supplied with the paper "analog" map. Geologic cross section lines (ex. A-A') are subsequently digitized as a line coverage and are hyperlinks to the scanned images.

Tim further demonstrated the developing NPS Theme Manager for adding GIS coverage's into projects "on-the-fly". With this functional browser, numerous NPS themes can be added to an ArcView project with relative ease. Such themes might include geology, paleontology, hypsography (topographic contours), vegetation, soils, etc.

### ***GRBIB***

At the scoping session, individual Microsoft Word Documents of Geologic Bibliographies for FOBU were distributed.

The sources for this compiled information are as follows:

- AGI (American Geological Institute) GeoRef
- USGS GeoIndex
- ProCite information taken from specific park libraries

These bibliographic compilations were validated by GRI staff to eliminate duplicate citations and typographical errors, as well as to check for applicability to the specific park. After validation, they become part of a Microsoft Access database parsed into columns based on park, author, year of publication, title, publisher, publication number, and a miscellaneous column for notes.

From the Access database, they are exported as Microsoft Word Documents for easier readability, and eventually turned into PDF documents. They are then posted to the GRI website at: <http://www2.nature.nps.gov/grd/geology/gri/products/geobib/> for general viewing.

### ***EXISTING GEOLOGIC MAPS***

After the bibliographies were assembled, a separate search was made for any existing surficial and bedrock geologic maps for FOBU. The bounding coordinates for each map were noted and entered into a GIS to assemble an index geologic map. Separate coverage's were developed based on scales (1:24,000, 1:100,000, etc.) available for the specific park. Numerous geologic maps at varying scales and vintages cover the

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area. Index maps were distributed to each workshop participant during the scoping session.

### **Geologic Mapping:**

At present, two 1:100,000 scale geologic maps have been published by the USGS as the Kemmerer 30x60 sheet (Geologic Map Of The Kemmerer 30' X 60' Quadrangle, Lincoln, Uinta, And Sweetwater Counties, Wyoming by J.W. M'gonigle and J.H. Dover, USGS Map I-2079, 1992) and the Evanston 30x60 sheet. Both are useful maps, but were apparently mapped at this small scale and thus are not the best available data for managing the parks geologic resources.

FOBU staff desired larger scale mapping (1:24,000 scale) for the area in and around the park, as it is important to the geologic story of the region. Therefore, they submitted a PMIS proposal to complete new field mapping of 12-7.5' quadrangles over 3 years. The proposal was approved and funded by NRPP and began in summer 2002. The 12 quadrangles are being mapped as follows:

- 2002: Nugget, Fossil, Warfield Creek, Bell Butte NE
- 2003: Windy Point, Sage, Beckwith, Rock Slide
- 2004: Kemmerer Reservoir, Bell Butte, Elkol SW, Little Dee

This new geologic quadrangle mapping is being coordinated by Dr. Paul Buchheim of Loma Linda University. He has excellent knowledge of the area and the Green River Formation in particular. Mapping will be conducted using the most current technology (GPS, GIS, etc.) and digital geologic map products will be the end result.

FOBU staff will be required to submit occasional updates on the status of this project because it is an NRPP project.

During the scoping session, the attendees had a brainstorming session to attempt to come up with the proper geologic themes that should be captured in a data dictionary. This data dictionary will be used in conjunction with the GPS receivers while mapping is being conducted. This should simplify immensely the efforts in converting the mapping data into digital geologic map products. To this effect, see the end of this document for the agreed upon data dictionary.

The Wyoming Geological Survey is interested in publishing the 12 quadrangles as part of their geologic mapping program to cover the entire state at 1:100,000 scale. The contact there are Alan Ver Ploeg (geologist) and Joe Huss (GIS). When GRI staff finish assembling the digitized maps, we will pass them onto the Wyoming GS staff for publication.

### **Digital Geologic Map coverage:**

In the recent past, FOBU staff submitted technical assistance requests to have the two existing published USGS 30x60 sheets digitized. These were done by the NPS Intermountain GIS support office and are available for download from the NPS-GIS Clearinghouse. However, several attributes required by the NPS GRI geologic model

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are missing and hence may require additional attribution if they were considered to be useful.

The new mapping will result also in digitized geologic maps of the 12 quadrangles. GRI staff will acquire the field sheets and any other GIS data from FOBU staff and will develop digital products for this work, including incorporation into the NPS GIS Theme Manager format. These will also include FGDC compliant metadata, and will be available from the NPS I&M GIS FTP site housed in Fort Collins, Colorado at <http://www3.nature.nps.gov/im/gis/ftp/ftparchive.cfm>

### Other desired GIS data:

Soils maps are also of interest to FOBU staff. Pete Biggam (NPS-Soil Scientist) says there are no immediate plans to complete a soils inventory for FOBU. Park staff should contact Pete if they wish to discuss this further.

### Miscellaneous:

- Tim Connors will acquire all 1:24,000 scale existing paper geologic maps for FOBU area and send geo-referenced scans to the park for their use.
- Aerial photos need rectifying
- Isopach maps exist for all geologic units, and numerous cross sections from seismic data have been published and should be incorporated into the database.
- Lastly, there has been recent interest in the establishment of the Fossil Basin as a world heritage site. If it were, it would be the first location in the United States established as a world heritage site based on paleontological significance (Yellowstone and Mesa Verde NP's have been established for other reasons). Vince Santucci supplied the following in regards to this:

*The fossil record preserved within the Eocene Green River Formation of Fossil Basin is world-renowned. Over one hundred years of intensive collecting has revealed a wide diversity of fossil fish, reptiles, birds, mammals, insects, and plants. New discoveries of fossil species continue to be reported from within the ancient lake sediments, expanding our understanding of the paleoecosystem.*

*Most notably, the quality of fossil preservation is extraordinary, nearly unparalleled in the fossil record. The quiet-water conditions and fine-grained sediments of the ancient lake have resulted in complete articulated skeletons. The delicate bones of fish, birds, and even a few bats, yield scientific data rarely preserved.*

*Fossils from Fossil Basin are found in museums around the world. Intensive commercial fossil collecting from areas surrounding the Monument yields tens-of-thousands to hundreds-of-thousands of fossil fish each year. These fossil fish represent perhaps the most common type of fossil vertebrates for sale anywhere in the world.*

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*A small portion of Fossil Lake is protected and managed by the National Park Service. Fossil Butte National Monument is a site that promotes the protection of this world-class paleontological heritage. Further the Monument was established and is managed in order to:*

- 1) educate the public at large in geological (paleontological) sciences;*
- 2) ensure sustainable development (geotourism); and*
- 3) protect endangered geological (paleontological) heritage sites for future generations.*

*These goals directly coincide with the goals of the UNESCO World Heritage Site Program. As commercial fossil activities rapidly deplete the non-renewable remains of the ancient lake around the Monument, the staff from the National Park Service are initiating the nomination of Fossil Butte National Monument as Geological Heritage under the World Heritage Site Program.*

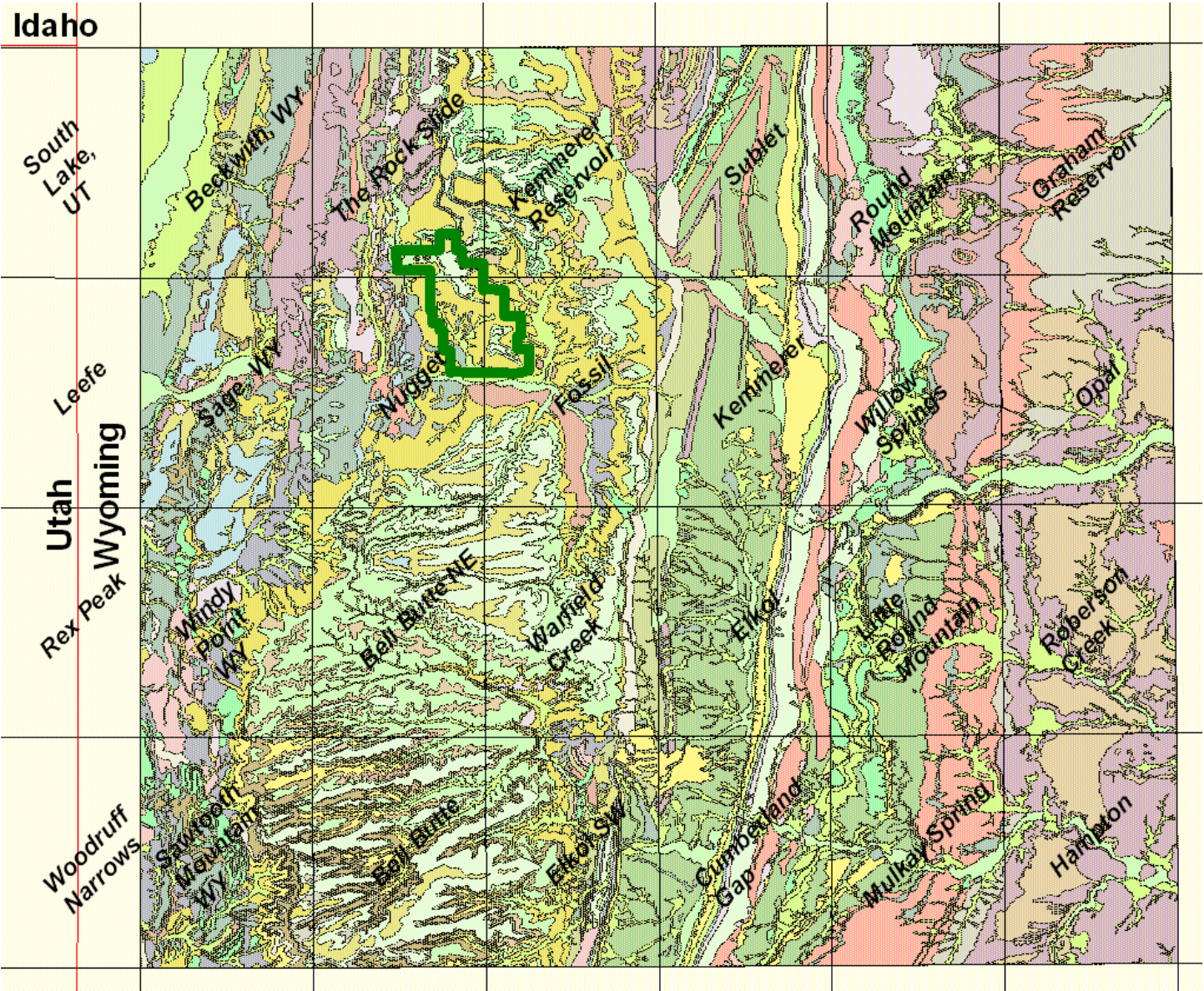


**List of Cooperators**  
**Fossil Butte NM GRI meeting**  
**May 23, 2002**

NAME		ORG	AFFILIATION	TITLE	PHONE	E-MAIL	Field Trip	Scoping Session
Aase	Arvid	Federal	NPS, FOBU	paleontologist	307-877-4455	arvid_aase@nps.gov	yes	yes
Buchheim	Paul	Academic	Loma Linda University	Geologist	909-588-1000, ext. 48904	pbuchheim@univ.llu.edu	yes	yes
Connors	Tim	Federal	NPS, Geologic Resources Division	geologist	(303) 969-2093	Tim_Connors@nps.gov	yes	yes
de Wolfe	Victor	Academic	Colorado State University	geologist	970-407-8157	vwolfe3@yahoo.com	yes	yes
Jennings	Debra	Academic	NPS, FOBU volunteer		307-766-4755	debra_hawkins@hotmail.com	yes	yes
O'Meara	Stephanie	academic	NPS, Natural Resources Information Division	geologist	(970) 225-3584	Stephanie_O'Meara@partner.nps.gov	yes	yes
Poole	Anne	federal	BLCA/CURE, GIS	GIS	(970) 240-5331	Apoole@co.blm.gov	yes	yes
Santucci	Vince	federal	NPS, Geologic Resources Division Fossil Butte NM, Wyoming	paleontologist	(307) 877-4455	Vincent_Santucci@nps.gov	yes	yes
Ver Ploeg	Alan	State	Wyoming Geological Survey	Geologist	(307) 766-2286, ext. 230	averpl@wsgs.uwyo.edu	No	no
Huss	Joe	State	Wyoming Geological Survey	GIS	(307) 766-2286, ext. 230	Jhuss@wsgs.uwyo.edu	No	No
Thornberry	Trista	academic	Colorado State University	geologist	970-491-5147	tthorn@cnr.colostate.edu	yes	yes



Quadrangles of Interest for Fossil Butte NM superposed on existing digital geologic map of the Kemmerer 30' x 60' sheet





# FOBU data dictionary for geologic mapping

1. formation names: Wasatch, Green River, Twin Creek Limestone, Cretaceous rocks: Frontier (*use Kemmerer 100k for the names*); Quaternary

Green River Members: middle, lower, upper

Wasatch tongues: mudstone and sandstone tongues, basal member of Wasatch

2. clastic dikes
3. Faults: normal, reverse, names of individual faults, amount of displacement (if any), dip of fault plane
4. Folds: anticlines, synclines, monoclines
5. Attitude points: strikes and dips, joints, crossbeds, paleocurrents
6. Fossil locality (sensitive); trace fossils
7. Contacts and control points to do mapping from
8. Strat section points
9. Private quarry locations
10. Geochemical point data
11. Isopach maps
12. Slumps/slides/hazards
13. Type sections
14. Paleo shoreline
15. Marker beds as contacts (ashes, trona)
16. Maybe mines or old prospect pits; abandoned oil wells
17. Springs/reservoirs
18. Measured unit thickness points (strat, coal, anything where thickness measured)
19. Surficial (fans vs. stream deposits vs. terrace deposits vs. slumps)
20. Maybe dikes